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BULLETIN

OF THE

NATURAL HISTORY SOCIETY

OF

NEW BRUNSWICK.

NO. II.

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BULLETIN

OF THE

NATURAL HISTORY SOCIETY OF NEW BRUNSWICK

NO. II.—1883.

ARTICLE I.

LACUSTRINE FORMATION OF TORRYBURN VALLEY.

BY G. F. MATTHEW, A. M., F. R. S. C.

With Dr. T. F. Allen's Notes on the Characeae.

While much attention has been given by Geologists to the deposits of the early and middle part of the Quaternary period in North-Eastern America, there is a part of this great cycle of time about which we have yet a great deal to learn, and which is of especial interest as forming the connecting link between Quaternary and Recent Time. The interest felt in this part of the geological record is enhanced by the fact that the deposits yield the earliest traces of man—for it is probably to this period that the gravels of Trenton, New Jersey, containing the rude stone implements of a primitive race belong.

The Boulder clay and Leda clay which were formed in Quaternary times have been closely investigated, and much is known of the animals which inhabited the seas and shores of North-Eastern America in the Leda clay or Champlain epoch. Even the vegetation of the land can be described in a general way with considerable accuracy, but of the succeeding Terrace epoch the biological history is very imperfectly known. The deposits of the Torryburn Valley, five miles N. E. of Saint John, supply an important link in this part of the geological chain; and the period in the Terrace epoch

when this valley was elevated above the sea and occupied by fresh-water lakes, can be indicated with considerable exactness.

The time when the Torryburn deposits began may be arrived at from the following considerations :

The raised beaches and sand flats of the Terrace period in this region, which are of Quaternary age and form the connecting link with the Torryburn deposits, contain but few mementoes of the Life of those times. The "Saxicava sands" of the St. Lawrence Valley which were formed in the Terrace epoch, and were once sand flats along the sides of that valley, are characterized by the remains of the sea shells, *Saxicava rugosa (arctica)*, and *Tellina (Macoma) groenlandica*; but in the corresponding deposit near Saint John the former of these shells is to a great extent replaced by the Common clam (*Mya arenaria*), so that it becomes a "Mya" or "Macoma" rather than a "Saxicava sand." Such deposits of the Terrace period can be traced down to the present sea level, and there are indications that they extend many fathoms below that line. From this we infer that the sea at the close of the Terrace period had withdrawn far from the present shore line and that the latest Terrace deposits are now concealed from our view, by the return of the sea to its present level along the coast. During the time when these changes of land and sea were going on, the fresh-water deposit of the Torryburn Valley was accumulating. It may be said, therefore, that the Champlain epoch had passed away and the Terrace period was considerably advanced when the first fresh-water beds were formed in the Torryburn lakes. In this part of Canada the Champlain or Leda clay was deposited in a sea which stood about 200 feet above the present sea level; and in that part of the succeeding Terrace period when the divide of the Torryburn Valley was exposed by the rising of the land, the sea had shoaled so far as to bring the land up to within 65 feet of its present level. Two important shore lines marked by terraces, had already been raised above the water when the Torryburn lakes first appeared, and two others of equal importance mark the slopes along the sea-shore, below the level of the summit of Torryburn Valley; the 65 feet level may therefore be considered as holding a middle place in the Terrace epoch, if we suppose that epoch to begin when the higher part of the Leda clay was a-wash at the sea-level. But if the beginning of the Terrace period be

reckoned from the time when the latest of the Saxicava or Macoma sands* began to be deposited on the Leda clay at the present sea level, then the first of the Torryburn fresh-water deposits must be relegated to the latter part of the Champlain epoch. It seems, however, more correct to regard the Terrace period as overlapping the Champlain, and therefore to consider the local deposits of Torryburn Valley as beginning in the middle of the Terrace period.

In the Torryburn Valley there are three depressions which were once occupied by ponds of water. Of these hollows, the southern one was shallow and was soon silted up; another, the eastern, was through the greater part of the Recent period occupied by a shallow lakelet, but finally became dry. The third or central depression of the valley was much deeper than the others; it still holds the reduced waters of a lake, which once rose to its rocky brim, and is known as **LAWLOR'S LAKE**.

The geology and physical history of these basins is of much interest in connection with the fresh-water deposits, and will be described in a future article, but the following observations are confined to a description of the fresh-water deposits only.

In the process of building the E. & N. A. (now the Intercolonial) Railway, a heavy rock-cutting was made at the Western end of Lawlor's Lake, and about 13 feet in depth of its waters were drawn off. By this means the beds of shell-marl which underlie the waters of the lake were exposed to view, and attracted the attention of certain members of this society. Samples of the marl containing fresh-water shells were sent to the museum of Comparative Zoology at Cambridge, and the peculiar varieties of a species of *Valvata* occurring in them, attracted the attention of Prof. Alpheus Hyatt of Boston, who visited the Lake in 1877 for the purpose of examining the marl. At his request I undertook to study the geology of the deposit, in connection with his proposed work on the biology of the mollusca which inhabit its waters and are found in the marl beds.

To investigate certain doubtful points which had come up, I found it necessary to make more careful examinations than I at first contemplated, and in the summer of 1880 and 1881, made collec-

* *Macoma groenlandica* is a small, lenticular, bivalve mollusc about the size of the human thumb-nail, a variety of which, *Macoma fusca*, is now quite plentiful along the sandy beaches of the Bay of Fundy.

tions of material from the base to the summit of the lacustrine deposit. These collections which exhibit the whole series of layers in the deposit, from the Saxicava or Macoma sand upward, have since been examined in a general way, and a synopsis of the results obtained, in so far as they relate to the Land vegetation, and the fresh-water plants of the order *Characeae*, are given in the following pages, together with valuable notes on the Characeæ from the pen of Dr. T. F. Allen of New York, a celebrated writer on these low forms of vegetable life.

As the investigation of the deposit of the lake is not yet completed, I shall only give at present a brief outline of the physical aspect of the formation, chiefly to elucidate Dr. Allen's notes on the Characeæ.

Before my examination of the lake deposit it was not suspected that any lacustrine beds other than the marls existed there, the underlying clays being supposed to be marine; but it was found that the pure shell-marl formed relatively less than a half of the whole lacustrine deposit, where it is accessible along the present margin of the lake. Several pits were sunk through the fresh-water deposit, and the most complete series of beds observed is that given in the following section. The numbers indicate groups of beds which have a common physical aspect, and the letters a thickness in each case, with a few exceptions, of about 3 inches of the deposit.

No. 1 *a* Marine sandy clay (Saxicava or Macoma sand) with marine molluscous remains of species found in the Upper Leda-clay and Saxicava (Macoma) sand.

No. 1 <i>b</i>	}	Lacustrine clay,.....	17 inches.
No. 2 <i>a b c</i>			
No. 3 <i>a b</i>			
No. 4 <i>a b</i>			
No. 5 <i>a b</i>		Lacustrine peat,.....	3 "
No. 6 <i>a b c d</i>	}	Peaty marl,.....	25 "
No. 7 <i>a b c d e</i>			
No. 8 <i>a b c d e</i>	}	Pure marl,.....	36 "
No. 9 <i>a b c d e f g</i>			

The whole lacustrine deposit rests everywhere upon the Saxicava sand which owing to the sheltered position in which it was accumulated is largely mixed with clay, to this cause probably is to be

attributed the presence of such species as *Balanus crenatus*, *B. Hameri* and *Mytilus edulis*, common in the Upper Leda-clay but which are also found in the marine beds immediately beneath the lacustrine clay of Lawlor's Lake. The passage from the marine to the fresh-water part of the clays, though not obvious to the eye, can be detected by a change in the specific gravity of the clay, and this will be found to be a useful method of separating the different parts of a continuous deposit, partly of salt-water and partly of fresh-water origin. At 1*b* the clay is about 1-10 lighter* than the marine clay beneath, and in the next inch No. 2*a* is reduced so as to be only two thirds of the weight of 1*a*. This change of density in the clay is due to the introduction of organic matter, chiefly low forms of vegetation which must have grown abundantly in the lake after the exclusion of the sea. The vegetable matter is mostly cellular tissue and not readily noticed except for the changed color of the clay; but its effect upon the weight of the clay can be at once seen by comparing the specific gravities, of Nos. 3 and 4, which are reddish clays like No. 1*b*, with that of the marine bed No. 1*a* which is only about a fifth heavier than these (Nos. 3 and 4.) The large addition of vegetable matter in No. 5, by which the color of the clay has been changed to olive grey, has a decided effect on the specific gravity; in the lower part of this division the weight is one quarter less than the standard of the marine clays, and in the upper part is not more than half. These weights do not express the full difference in the actual weight (less the water) of these different parts of the deposit when fresh; for in drying No. 5 lost nearly one quarter of its bulk, and No. 2 also lost in volume considerably. The shrinkage is no doubt due to the large quantity of cellular algae which these deposits contain. Such a marked difference between the weight of marine and lacustrine clays in the successive, or alternating beds of a deposit, is not to be looked for in larger basins, but I have no doubt the rule will be found to hold good to an appreciable degree in almost any fresh-water deposit formed in a basin of moderate dimensions.

Div. 5 marks an important epoch in the history of the lake, for at this period the influx of clay carried down by streams into the lake was arrested, and the molluscan fresh-water *fauna*, of which

*The weights given are those of air-dried samples of the deposit coarsely pulverized.

only the faintest traces can be found in the clay beds, immediately spread and occupied the waters of the lake. It is an interesting subject of inquiry as to what caused this sudden and important change in the condition of the lake and of the surrounding slopes.

The period during which the lacustrine clays were deposited was one of rapid and momentous change in the *fauna* and *flora* of the lake, being marked by the arrival and increase, and on the other hand by the curtailment in numbers and probably the extinction of species in quick succession. The part of the deposit above the peat, in the accumulation of which a much longer period of time was taken than was required for the clays, marks on the contrary a quiescent period and was characterized by a slow and gradual change in the *fauna* and *flora*.

One cause which may have had an important influence upon the deposits made during the period of the Lacustrine clay, was the condition of the surface of the land when Torryburn Valley emerged from the sea. The formation of terraces at various levels along the sea-coast in this region during the Saxicava period shews that the rise of the land from beneath the ocean at this time was not slow and gradual, but was effected by spasmodic movements which at once, or in a very short space of time, carried large areas of surface above the sea. Such a movement between the time of the formation of the 100 and of the 50 feet terrace would have exposed the steep hill-sides around Lawlor's Lake, at that time covered with marine clay, to the action of atmospheric agents; there was no mat of vegetation, nor covering of trees to absorb and retain moisture, and the effect of rains and spring floods in sweeping a turbid deposit into the lake can be readily understood. But the sudden cessation of this mechanical deposit at No. 5 and its subsequent entire exclusion from the lake is not so easily explained. Possibly an improvement in the climate may have been influential in promoting a more rapid growth of vegetation and in moderating the spring floods—possibly artificial dams made on the stream which enters the lake may have arrested the muddy waters in their course, and prevented them from entering the lake until deprived of the clay which they carried in suspension.

It would appear that the growth of the fresh-water plants was subject to much vicissitude during the time when clayey sediment was

pouring into the lake; but as soon as this ceased, these plants immediately took full possession of the lake in advance of the arrival of the molluscan *fauna*, and even after this addition to the living forms which peopled the lake, the lacustrine vegetation formed a predominating element in the deposit made at its bottom. After the arrival of the mollusca, however, the species of plants were not all the same as those which lived in the lake before that time, but included forms better suited to the clear, calcareous waters in which the water-snails delighted. Such plants, too, as were now in the lake had a better hold of their habitat, flourished in great numbers, and the species were not replaced with the same rapidity as their predecessors had been.

OBSERVATIONS ON THE CHARACEÆ.

The Charæ participated in the conditions effecting other portions of the lacustrine vegetation, and their appearance in the lake at a very early period is noticable and somewhat remarkable. These plants are of a comparatively low order, and entirely aquatic in habit. They live submerged in the water, their seeds are not adapted for being wafted by the wind, and the disagreeable odour, which characterizes the living plant, would repel many animals, which are active in propagating other plants, by transporting their seeds from place to place; yet a species of this genus was one of the earliest migrants into the lake.

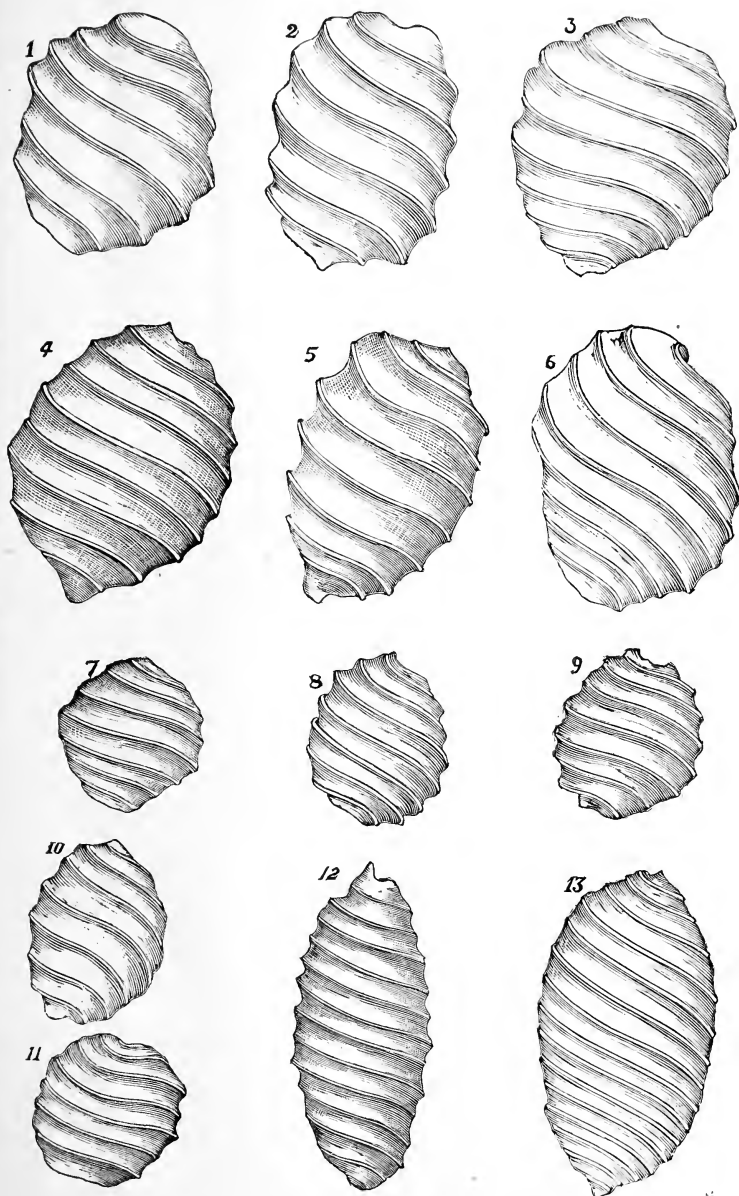
The permanency of Chara when it has once taken possession of a sheet of water may be inferred from the fact that different species flourish in lakes in the same neighborhood without intermixture for (historically) long periods of time—a lake having one or more species or varieties peculiar to itself. The early advent of Chara at Lawlor's Lake is therefore somewhat remarkable. It is true that some species of this genus inhabit brackish water; but the relations of Lawlor's Lake to the surrounding land show that at its emergence from the sea, the transition from salt to fresh water conditions must have been rapid, if not instantaneous.

Though the stems and leaves of Chara are perishable, the small nucleus or spores, which are about the size of a minute pin-head, are hard and durable; and owing to the spiral striæ or keels (due to the impression of the spiral tubes of the sporangia or seed vessel) with

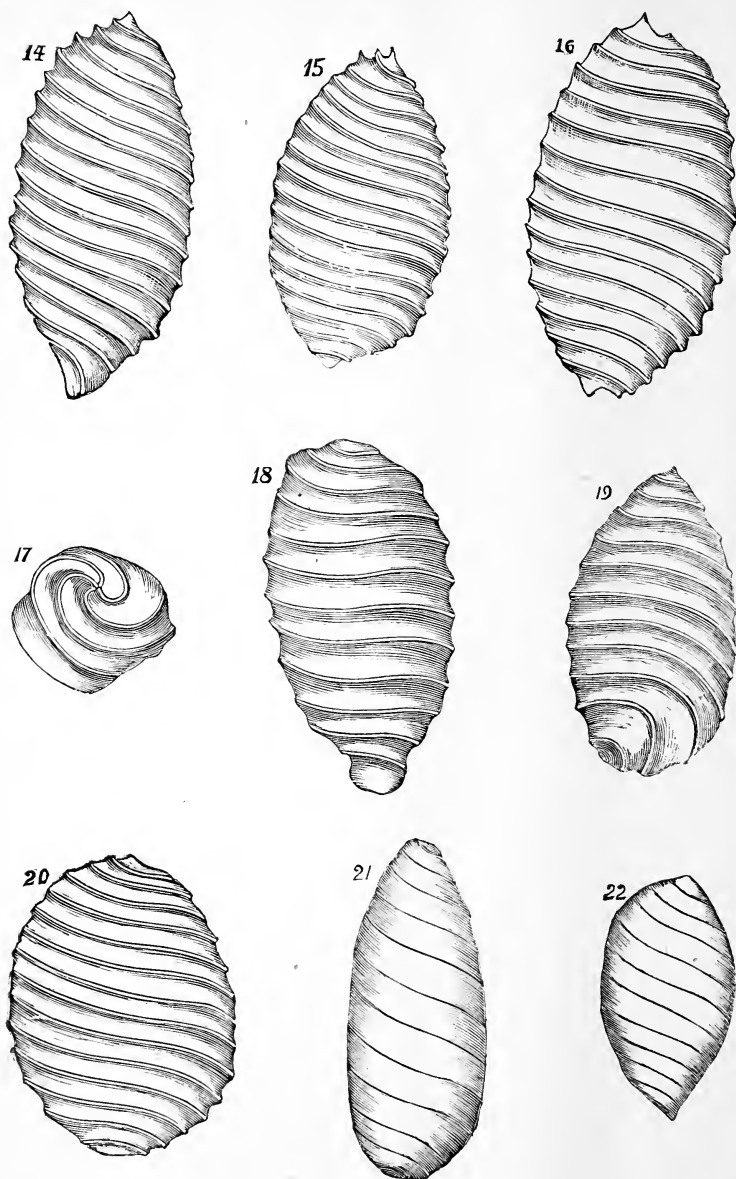
which they are ornamented, are very striking objects under the microscope. In the fossil condition these seeds are generally black, with a smooth shining surface, and the keels are usually coated with shining white crystals of calcareous salts. In the washings of the marl and clay beds these minute seeds float to the sides of the vessel and may be removed in great numbers. The seeds or spores though comparatively scarce in the lower divisions of the deposit, become very numerous in Div. No. 6, and in Nos. 7, 8 and 9 they are found in enormous numbers. They appear to be most numerous in the middle portion of Nos. 7 and 8, respectively, and in the upper part of No. 9. The species are distinguished by the form and size of the spores, the number and distinctness of the striae or keels, &c.

Dr. Allen finds the spores of one species, which he identifies with *Chara coronata*, Ziz., as low down as the lower half of No. 1b—the very beginning of the fresh-water clay. This species I found to increase in number in the upper part of No. 1, and the lower part of No. 2, but in the upper two thirds of No. 2, and in the lower half of No. 3, it appears to be scarce, as none were observed. It reappears in considerable numbers in No. 4 and the lower third of No. 5. This is the limit of the clayey sediment in the deposit, and I did not detect it higher up. Dr. Allen, however, found examples of what he considers the same species, “though sparingly,” in the higher numbers, 6, 7, 8 and 9. The species has left its remains most abundantly in the lacustrine clay, and they are especially numerous in those parts of the clay beds which are most heavily charged with mineral matter of sedimentary origin. Its abundance in these beds would seem to indicate that the species is partial to waters containing an abundance of argillaceous sediment. In the accompanying wood cuts the first four figures, copied from drawings by Dr. Allen, represent examples of this form of nucleus, arranged from left to right as they are found at successively higher levels in the deposit: the two last figures of the second row represent irregular forms, or varieties of the same species.

Another species which Dr. Allen detected in samples from the lower part of the lacustrine deposit is of small size, nearly globular, and has from 6 to 7 keels. This nucleus was found in the lower part of 2b and of 3b; also in 4a and in 6b, &c. Its range was therefore much the same as that of the last named species. Dr.



Spores of Characeæ, Lawlor's Lake.



Spores of Characeæ, Lawlor's Lake.

Allen says that this seed may belong to a *Nitella*, perhaps *N. megacarpa* Allen, as he knows of no *Chara* with similar nuclei. The third row of figures, and the first two figures of the fourth row, represent this species as drawn by Dr. Allen, and the forms are arranged in ascending geological order from left to right, the oldest being to the left in the third row.

The great bulk of the seeds of *Chara* found in the deposit belong to a species which exhibits considerable diversity in the form and markings of the nucleus. I did not find any form of this type lower down than the top of No. 2*b* ; but Dr. Allen has detected it in the upper part of 2*a* and the middle of 2*b*. It would, therefore, appear to be limited in the lacustrine clay, to that part which is least charged with mineral matter, and even there it is very scarce. It seems to have found difficulty in maintaining itself in a habitat where *C. coronata* flourished ; but later in the history of the lake, when the clayey sediment disappeared, it became immensely abundant. The partiality of this species for clear water is very evident in its increase and prevalence in the higher part of the lake deposit. When *C. coronata* disappeared from the lower layers of the Lake Peat, No. 5, this species immediately took its place, and at the top layers of the peat its seeds had become numerous. In No. 6 the seeds are quite common, and its prevalence in the lake seems to have been accelerated rather than retarded by the spread of the Molluscan fauna. This form of nucleus was long-elliptical-oblong with sharp keels or striæ, generally about 12 in number, but varying from 10 to 13 in those preserved in the deposit above the Peat (No. 5), though perhaps with more numerous ribs on the spores from the Lacustrine clay (No. 2, &c.). This nucleus, according to Dr. Allen, has the character of *C. fragilis* Desv. Nos. 12 to 16 and No. 17 (end view) are the principal varieties of this form, and are arranged in ascending order from left to right ; Nos. 18 and 19 are somewhat irregular forms of the same species.

Dr. Allen recognizes two other types of spores, one of which is broadly oval and with ribs less prominent than those of the *C. fragilis* form ; this occurs in No. 7*c*, &c., and has the characters of *C. intermedia* A. Br., a species now living in the lake. This form is figured in the last row on the wood cut. The other type of spore referred to above is figured beside it, and is smooth, long-oval and

has faint, spiral striæ or ribs. This Dr. Allen has not determined, but thinks it may be a variety of the last named species.

DR. T. F. ALLEN'S NOTES ON THE CHARACEÆ OF LAWLOR'S LAKE.

"In No. 1*b* are found the seeds of a *Chara* which with variations occur in most of the numbers, though sparingly in the higher numbers (7, 8 and 9). This form has seven prominent angles, varying to 6 and 8. Its length varies from 480*u* to 634*u*, and its breadth from 408 to 488*u*. The accompanying drawings magnified 50 diameters represent this form, (Figures No. 1 to 6.)

In Nos. 2*b*1, 3*b*1, 4*a* and 6*b* and *c*. is a small globular form, quite distinct; angles usually six varying to 5 and 7, prominent; length 340 to 365*u* breadth 315 to 340*u*; slightly longer than broad (Figures No. 7 to 11.)

From 2*a* up through all the numbers is found a large, variable, but definite form. The striæ are numerous, from 11 to 14 in number, the angles prominent, sharp. Length 536 to 550*u*, breadth 390 to 512*u*. Quite variable in form and size, but we have found it impossible to distinguish definite characters, owing to the innumerable intermediate forms. The most pronounced forms are given in Figures 12 to 20.

There is a form found now and then, especially in No. 6, with *very faint* striæ, but in other respects similar to the preceding. This form is given in Figures 21 and 22.

The recent *Chara* from the adjacent pond (Lawlor's Lake) belongs to the species *Chara intermedia*, A. Br., probably to variety *Americana*, A. Br., but as it is immature (in the sample sent) the seeds cannot be inspected.

Note 1.—The first mentioned species belongs, doubtless, to a form or forms of *Chara coronata* Ziz. This species is exceedingly variable in size and general appearance; the seeds found in these deposits approach closely to our common form, known as variety *Schweinitzia*, but the angles are much more prominent and sharp, and its outline and general appearance differ considerably. (Figs. 1—6).

Note 2.—The small globular seeds may belong to a *Nitella*; we know of no *Chara* with similar nuclei. The species cannot be determined, though from the character of the nuclei we might infer

their belonging to a species not uncommon in that region (North-Eastern North America), *N. megacarpa*, Allen, (Figs. 7—11).

Note 3.—The large black seeds may be classed in three groups, the long and rather narrow, with sharp angles, (Figs. 12—18), the broadly oval (Figs 19 and 20), and the oblong with very faint striae (Figs. 21 and 22). The first group has the characters of *C. fragilis* Desv. ; the second of *C. intermedia*, A. Br. (now living in the lake), and the third cannot be determined accurately ; possibly it may be a form of the latter class.

Note 4.—We do not discover any progressive change of form in the nuclei from different numbers (or divisions of the lacustrine deposit), nor any characters which would lead us to suppose any of the nuclei to belong to extinct species. The first form (*C. coronata*, probably) has no *exact* counterpart among our existing species, but they are not well known."

NOTES ON THE LAND FLORA AND FAUNA.

Scattered through the various members of the lake deposit, but more particularly abundant in the Clay, are fragments of wood, bark, cones of evergreen trees, bud-scales and leaves, and fruits of several species of Land plants. Among the earliest determinable objects of this kind are the leaves of the American Fir (*Abies balsamea*): these leaves were not found plentifully, and are smaller than the average of leaves of the firs now living in the neighborhood. This species was not found so low down in the deposits of Lawlor's Lake as in those of the Eastern Basin.

The seeds of the European Cranberry (the small marsh cranberry) (*Vaccinium oxycoccus*), has a wide range through the deposits of Lawlor's Lake, but is less plentiful in those of the Eastern Basin. It was very plentiful throughout the layers of Div. 2, having first appeared in Division No. 1. Throughout Nos. 3, 4 and 5, it is also found, but above this becomes scarce. The appearance of this species among the first in the lake deposit is quite in accordance with Nature's provisions for its propagation,—namely: the tough, impervious skin of the fruit, the floating air-cells of the pulp, the hard nut-like covering of the embryo, &c.

In the Eastern Basin the remains of the Black Spruce (*Abies nigra*.) were found at a lower level than in the deposits of Lawlor's

Lake, having been observed in Div. 2, but the numerous twigs and branches of soft-wood trees buried in the Lacustrine clay at this horizon are probably in part of this species. The leaves were smaller than the average of those of living trees.

The Larch (*Larix Americana*) was also first detected in the Eastern Basin, but occurs at a higher level in the Lake deposit. In their slenderness, and the close approximation of the nodes to which the leaves were attached, the twigs resemble those of trees that grow in bogs, or wet land with a cold northern aspect.

The Sweet Gale (*Myrica Gale*), a bush with leaves that yield a balsamic odor when crushed, was plentiful around the borders of the Eastern Basin when the beds of No. 5 were deposited in the Lake.

In the Eastern Basin at the horizon of No. 6 of Lawlor's Lake deposits, cones of the White Cedar (*Thuja occidentalis*) were first observed—and the same basin at No. 7, contained remains of the Yellow Birch (*Betula lutea*),—a species of Willow and a number of species of deciduous shrubs and trees, including Birch, Alder and other kinds, still undetermined, grew around the Eastern Basin, or at Lawlor's Lake. Among species that grew in a pond in the former was the Water Lily (*Nuphar advena*?) and both sheets of water were plentifully supplied with several species of Pond Weed (*Potamogeton*).

The scarcity of the seeds of the Bog Cranberry in the bed above the Lake peat, No. 5, appears to be connected with the appearance in the Lake Basin of a grass, the seeds of which first appear in the upper part of No. 5a. These seeds increase rapidly in number, in passing upward through No. 6, and in 6c are enormously abundant. 120 seeds have been counted in a cubic inch of this part of the deposit. In 6d their numbers are much reduced, and throughout No. 7 they are about half as numerous as in No. 6c. In division 8 there is a great falling off in the abundance of these seeds and throughout No. 9 they are quite scarce. This grass must have grown in immense quantities around the shores of the lake when the peaty marl of Nos. 6 and 7 was being deposited. The appearance of this grass was synchronous with the exclusion of turbid waters from the lake, and its presence may have been connected with causes which led to a change in the mineral composition of the deposit in the lake, for

about this time appeared those primeval architects of the northern streams.

THE BEAVERS.

No traces of these creatures have been observed below No. 5; but at this horizon in the Eastern Basin minute chips of wood were found, bearing marks of the teeth of a gnawing animal, and the leaves of the deposit become papery, as if macerated in water, showing that a pond had been formed in that part of the valley. More decided indications of the presence of beaver appear in No. 7, which contains fragments of branches of trees that have been gnawed by these creatures. Similar gnawed sticks were found in the deposit in Lawlor's Lake at the horizon of the Peaty marl, (Nos. 6—7,) and further indications of their work in two beaver dams at the West end of the lake. Of these dams the one at the outlet of the lake has been nearly destroyed by the operations connected with the building of the Intercolonial Railway: but the other is perfect and extends down through Nos. 9, 8, 7 and 6 of the Lake deposit. Along the lake front of this dam the two middle divisions, Nos. 7 and 8, had been compacted into a dark, grey peaty mass, full of sticks and twigs of ameteriferous and coniferous trees. No. 5 also abounds with similar fragments of trees; and with seeds, glumes, spikes and culms of the grass referred to in a previous paragraph, intermingled with seeds of pond weeds; and contains also cones of Black Spruce, and fragments of the tests of insects.

At the level of Div. 6 leaves of coniferous trees and of the woodland Horse-tail (*Equisetum sylvaticum*), seeds of various plants and a cone of the Larch tree were imbedded in the deposit. Here also on the outer slope of the dam, the Molluscan fauna which had invaded the lake becomes conspicuous, the dark loam of the dam being speckled and blotched with scattered shells of water snails of the genera *Planorbis*, *Limnæa* and *Valvata*, as well as a few shells of a little bivalve called *Pisidium*.

Similar remains with the addition of a *Sphaerium* among the molluscs, and fragments of mosses, seeds of the Black Spruce, and a greater variety of the seeds of other plants than occur below are found in Div. 7. Leaves of the Sweet Gale which in the Eastern Basin occur as low down as No. 5, were here found in No. 7.

At the horizon of No. 8 the molluscs of the lake were found in the greatest abundance. They were entangled among the twigs and branches which abounded on the slope of the dam and include, beside the genera mentioned above, a water-snail of the genus *Physa*.

The remains of the molluscs become quite scarce in the next division (No. 9) along the face of the dam, having been driven further out into the lake by the accumulation of vegetable rubbish and debris brought in by the beavers. But though fragments of the branches of trees are quite plentiful in this part of the dam, the layers are more sandy, and the specific gravity greater than that of the underlying portions of the dam. This may have been owing either to increased floods in the streamlet which here enters the lake, or to the operations of the beavers in plastering the dam. The specific gravity here is 1.4, but in the lower layers, (No. 6) in the front slope of the dam is 1.08. In the foot and a half in depth of black loam which forms the top of the dam the specific gravity was only 0.24. This portion was apparently the part of the dam which stood out of the water, was not permeated by mud, and became the foundation for a vigorous growth of trees when the beavers were driven from the lake.

About the slopes and ends of the dam grew the grasses, sedges, horsetails and other herbaceous plants which have shed their seed so plentifully into the lake, in its front; and on the other side of the dam was a small pond fed by a little rivulet (the only one which enters Lawlor's Lake)—where, no doubt, the habitations of these intelligent creatures were built.

TRACES OF PRIMEVAL MAN.

Such was the home the beavers had made for themselves in this secluded valley, providing for their own wants and at the same time protecting the interests of their molluscan neighbors in the lake. It is to be feared, however, that their busy and peaceful home was not free from the incursions of enemies. A small fragment of *charcoal* found some distance beneath the surface in the deposits of the Southern Basin tells, probably, of the presence of *Man* in this valley, long before the advent of the English or the French Colonist,—possibly even before the arrival of the "Indian" race, whom the

European colonists found in possession of the country. The deposits of the Southern Basin did not begin to accumulate rapidly until the formation of the 50 feet terrace of the Saxicava period, and are younger than the earliest of the lacustrine beds. Their thickness is about seven feet, of which the lower four-and-a-half feet are clays and sands with occasional layers of brown peat. About six inches in depth from the top of these sandy clay beds the charcoal was found. The upper two-and-a-half feet of the deposit consists of dark brown and black peat which had accumulated after the basin ceased to be flooded with water carrying muddy sediment, and was converted into a swamp. Firs, cedars, alders and other bushes and trees helped to build up a mass of vegetable matter apparently after man came upon the scene. And the beaver continued to build during the same period in Lawlor's Lake. They were not exterminated; we do not know that they were even much disturbed by their more powerful and dangerous rival in the art of constructing dwellings.

CLIMATE OF ACADIA DURING THE RECENT PERIOD.

At the present day the climate of this region is very much milder than it was during the Glacial or Boulder-clay period. How it became ameliorated as time went on, is an interesting subject for investigation, and has to some extent been elucidated by the writings of Dr. J. W. Dawson and others. The remains of marine animals entombed in the Post-Pliocene deposits do not so clearly show this, as do the remains of land plants, because they tell rather of the temperature of the sea and its currents, than of the warmth or dampness of the air circulating over the land, or the influence of the sun in promoting vegetable growth. By means of the plants remains of the Champlain epoch Dr. J. W. Dawson has shewn that the climate of the Ottawa valley during that period, was about as warm as the southern coast of Labrador is at the present time.

All of the plants named by Dr. Dawson as occurring in the marine clays of the Ottawa valley except the Balm of Gilead (*Populus balsamifera*) might now be found growing freely in a wild state near Saint John. There would, nevertheless, be many species of a more southern range mingled with them, showing a more genial climate, but I am inclined to think that the plants which occur in the lower part

of the lacustrine beds of Lawlor's Lake may be looked upon as having a more northern *facies* than those of the upper part, or than those living in this region at the present day. There is a prevalence in the lower part of plants of High-northern distribution, as the Black Spruce, the Fir, the White Birch and the small Bog Cranberry. The Larch and the Sweet gale come in higher up in the beds and the White Cedar, the Water Lily, the Alder and other broad leaved shrubs and trees are found still later. But the apparent absence of these plants from the lower deposits is not much to be depended on as a proof that they were not growing here then ; and it is to be noted that the Fir which is of a somewhat more southern range than the Black Spruce is found at the base of the deposit and must have been growing here when Lawlor's Lake first emerged from the sea.

In the stunted appearance of the plant remains found in the lacustrine clay, there would nevertheless appear to be an indication that the plants which grew upon the slopes around the lake when the salt-water left it, were not so well nourished as those which clothed its margin in later times. The leaves of both Spruce and Fir were smaller and the twigs of the Larch were slenderer, and had the projecting nodes to which the fascicles of leaves were attached, smaller and more closely approximated than in individuals living in similar situations at the present day.



BOTANY OF THE UPPER ST. JOHN.

BY G. U. HAY.

[Read before the Society, November 7th.]

In the course of two hasty visits to the upper St. John, the first in the summer of 1879, and the second during the past summer, I have been enabled to discover the whereabouts of some plants not before found in the Province, and to extend the range of a considerable number of species hitherto confined to a single locality, or which are at least comparatively rare in this country. "A page in the Botany of the Upper St. John" would perhaps be a more modest title for the present paper, as a much more extended observation of the territory chiefly explored must be made before an accurate account of its flora can be given.

I have noted in the following pages only such plants as are new and rare to the Province. The journey in each case was made in mid-summer when forest and river bank were literally teeming with vegetation. The length of each trip, the short time for its accomplishment, and its pleasures and difficulties were impediments to the slow and careful work so necessary in the examination of any particular territory. Then on the one hand the ferocious assaults of black flies and mosquitoes, the labour of striking and folding tents, and providing for material wants, made the pursuit of science one of some difficulty; while on the other, the keen delight experienced in viewing the magnificent stretches of scenery which the upper waters of our River afford, and the exciting sport of now running rapids and again rushing along with wind and current at the rate of six or eight miles an hour would prove too strong an antidote to scientific zeal, and the plants on shore would get a bare nod of recognition in passing.

The field presented to the botanist by the St. John River and its tributaries is an interesting one. Entering the Province at its extreme north-west corner the River sweeps along with varying current for nearly 300 miles before it passes our doors. Unfor-

tunately this basin is not all ours. The south and west bank for nearly 75 miles is foreign territory ; and for about 40 miles further, below Grand Falls, our slice of territory is so thin that a good-sized jump from the west bank of the River would almost land one in Uncle Sam's territory. Nevertheless we have enough left to be proud of : with a quality of soil and a beauty of landscape that will compare favorably with any other spot in the world, it needs only patient labor and perseverance to give an industrious population very great material advantages. To the botanist this is almost an unknown land. The careful and interesting paper read at a recent meeting by Prof. Bailey showed us that the River now can be made to trace the story of its birth and growth. The vegetable organizations along its banks have yet to be subjected to that examination which shall reveal data enabling us to compare them with other vegetable forms past and present, their limits in the geographical distribution of plants, with other facts that will make our botanical information of interest and value to scientific men the world over. Could our legislators realize more fully the importance of encouraging the researches of those engaged in studying our natural history and resources, they might see our Province take a more advanced position in the scientific world.

The only careful investigation of the flora of the upper St. John that has been made was that by Prof. Goodale, in the scientific survey undertaken by the Government of the State of Maine some years ago. Although that survey was confined to the State of Maine, it is presumable that the plants discovered in northern Maine have their representatives in northern New Brunswick. But we would be a poor set of scientists to accept that result without patient and determined investigation. Again : it is highly probable that we have plants in northern New Brunswick not found in Maine. It would seem to be a fact in one instance at least, for I found *Polygala Senega* at the Mouth of the Aroostook in July last. It has never been found, so far as I can ascertain, North of Massachusetts, and its habitat is south and west of that State. This is a further testimony to the fact established by that scientific survey in Maine, that the flora of the Aroostook Country has a southern character, in other words that the climate and soil in Aroostook are adapted for plants which grow several degrees south of us. In my visit to the upper St.

John and Madawaska in the Summer of 1879, I found there many of the plants found by Prof. Goodale in the Aroostook territory; many more were observed during the past summer. I shall refer to these in another part of this paper.

But the botany of the River below Grand Falls has been more systematically observed. Mr. Matthew appears to have been the pioneer in botanical investigation on the southern St. John and Kennebecasis. The botany of the River above Fredericton has been pretty carefully studied by Prof. Bailey, Prof. Fowler, Mr. Vroom, Mr. Moser and others. Mr. Fowler, though he had not much time for extended investigation of this territory, infused enthusiasm in those who were fortunate enough to enjoy his instruction, and the student now finds his work systematized by the assistance of Mr. Fowler's published lists. One of the keenest observers of plants is Mr. J. Moser of York County, who is as modest and retiring as many of the plants he so industriously seeks out. He has made some very important discoveries of rare plants in York County and further up the River. Mr. J. E. Wetmore of Andover, one of Prof. Fowler's students, is carefully working up the botany of his district as far as his time will permit. So it will be seen that the number of those who take an interest in this—one of the most attractive of the natural sciences—is steadily increasing.

May we hope that the time is not far distant when every branch of our natural history shall be industriously studied and explored. Surely a country containing a population of over a quarter of a million should not longer be satisfied with scarcely a baker's dozen of active scientific workers. It might be in order for some energetic members of this Society to organize themselves into a committee on Conchology for instance,—take up the subject where Mr. Matthew has left it and pursue it further. Could not a Committee on Entomology be formed, and, emulating the example of our Ornithological Committee, work as perseveringly in this important branch of natural history. No subject is of greater practical importance to us than a knowledge of the habits of the insects which infest our fields and woods, and yet this branch is at present almost without a representative in our Society. While acknowledging then that we are displaying industry in some directions, are we not neglecting certain other departments we cannot afford to neglect in this age of scientific study and investigation.

Early in July last our party consisting of four persons ascended the St. John River and St. Francis to Beau Lake, the extreme North-western limit of the Province. The trip was made before the spring freshet had entirely subsided, so that many of the plants that do not appear till after the water falls could not be observed. Many of the early spring plants were found to be still in flower in shaded places, others were in fruit, while the summer plants were many of them in flower in the more exposed and sunny places. Thus I had an opportunity of observing, or partially at least, a double flora, which could not have been seen earlier in the season.

Commencing our investigations at the foot of Beau Lake, which we reached at noon in one of the hottest July days, we made a peaceful invasion of the Province of Quebec. *Rhamnus alnifolius*, a comparatively rare shrub in this Province was collected at this limit of our journey. From Lake Beau to the mouth of the St. Francis the distance is about sixteen miles, which is therefore the breadth of our territory in the extreme north-west of the Province. The River is deep and the current strong, in many places foaming in rapids, in others widening into lakes and ponds. The lower portion of the river, near the St. John is crooked, the land rising into high hills of Silurian slate with little or no interval between them and the river. These hills in many places present a desolate appearance from the ravages of fire. Above Glazier's Lake there are fine forests of spruce with occasionally some magnificent pines. The rapids are short between Beau Lake and Glazier's Lake, with one exception, where the waters roar and tumble through a rocky gorge, for the distance of a quarter of a mile. To enjoy the excitement of rushing through this torrent we had hauled our boat, a few hours before, up the almost perpendicular side of a hill. At the foot of these rapids we met a lonely voyageur in his dugout preparing for the toilsome ascent. This proved to be Mr. Morrison, who went in the wilderness some years ago, cleared a fine piece of interval near the head Lake Beau, and by patient industry and perseverance has carved out for himself a fine homestead in this wilderness. His nearest neighbors are at the mouth of the St. Francis, over 20 miles distant, if we except three habitans—squatters on the shores of Glazier's Lake.

At the foot of the rapids is a beautiful little stretch of interval on which I spent a few hours, examining its vegetation. Here were

magnificent clumps of the Ostrich Fern (*Struthiopteris Germanica*) almost tree-like in their luxuriant growth, some fronds being at least five feet in height. Here I found a single clump of the somewhat rare fern, with us, *Aspidium aculeatum*, var. *Braunii*, a few specimens of which I afterwards noted further down on Glazier's Lake and also at the mouth of the Aroostook. Several plants which have been heretofore detected infrequently, or in one or two localities only, appeared to be growing in profusion in this rich interval—*Polygonatum biflorum*, first found by Prof. Fowler at Fredericton, and later by Mr. Vroom at St. Stephen, is abundant here and further down the St. Francis River in the shady nooks of its rich banks. I noticed it also at Andover, where it had been detected earlier in the season by Mr. Wetmore. Here and further down the St. Francis were *Trillium cernuum*, *Caulophyllum thalictroides*, *Thalictrum dioicum*, *Viola Selkirkii*, *Anemone Virginiana*, *Vaccinium caespitosum*, *Cypripedium acaule* (with white flowers only).

Asarum Canadense (Wild Ginger) described in our last bulletin as rather common about Fredericton, its, until then, only known habitat in the Province, is abundant on the Upper St. John and St. Francis, as it was noticed on rich hillsides and intervals at nearly all stopping places. *Sanicula Marilandica* (Black Snake root) is abundant throughout the whole course of the Upper St. John. *Sanguinaria Canadensis* (Blood Root) is also very abundant in rich woods and on intervals along the Upper St. John and St. Francis. The last three plants are medicinal. *Sanguinaria* is a stimulant when taken in small doses, in large doses it acts as an emetic, while an overdose causes faintness, dimness of vision, great prostration, and even death. The American Journal of Science records an instance of the death of four persons some years ago, in Bellevue Hospital from mistaking a tincture of *Sanguinaria* for ardent spirits. *Asarum Canadense* is said to be used in some places as a substitute for Ginger; it has stimulating properties, and is said to be an effective remedy for dropsy. *Sanicula Marilandica* is spoken of in the United States Dispensatory, to which I am indebted for these facts, as a domestic remedy for intermittent fevers and St. Vitus' Dance.

Our guide, Antoine Gagnois, a squatter on the banks of Glazier's Lake, appeared to be a walking pharmacopœia and became very eloquent in speaking of the virtues of these and other herbs to be

found in his neighborhood. The nearest doctor is forty miles from his habitation, and yet he boasted that he had a healthy family, although his medicine chest contained only herbs. If the theory that every region produces the remedies best adapted for the diseases that prevail in it be correct, Antoine has good grounds for the faith that is in him. A party from the United States, so he informed me, visits the St. Francis every season to dig the Snake Root and other medicinal herbs. A few years ago Prof. Fowler drew attention to the fact that of the 360 plants employed in medicinal practice in the North-eastern States, more than 230 or 65 per cent. of the total number can be collected in New Brunswick. Here, then, is a philanthropic and profitable occupation awaiting some individual who has only to make himself acquainted with the plants, and become skilful in preserving them properly, to realize a competence therefrom.

Our French guide was a keen and intelligent observer of Nature and astonished me by the accuracy of his knowledge in regard to plants. He was utterly ignorant of any of the questions that disturb nations and individuals, yet he was learned in woodcraft and modest withal. Though these Acadian French are not the kind of people that advance the material prosperity of a country, they are a happy and kind-hearted race. They were always civil and courteous and ready to assist us as far as lay in their power. Their indifference and want of energy is nowhere more apparent than in their management of the soil; buckwheat everywhere is the crop year after year on land that would produce good wheat. This "Sarrazin," as they call it, is the staple article of diet when made into bread; when you see this bread and taste it, you cease to wonder at the want of energy of the *habitans*. With the materials in the soil to yield food products with more nourishing properties, it is to be hoped that those rich intervals of Madawaska may in the future yield wheat in abundance.

Our camping ground was at the foot of Glazier's Lake, four miles from the mouth of the St. Francis. On the third day after our arrival here we broke up camp, and a speedy run through the rapid river brought us again to the St. John.

We find the flora more varied on the Main River. One of the most abundant plants on the upper waters of the St. John is *Tanacetum Huronense* which has more finely dissected leaves and is not so

strongly scented as the *Tanacetum vulgare*, or more common tansy of the fields and gardens. This *Tanacetum Huronense* is a western plant, and was discovered for the first time in New England by Prof. Goodale a few years ago on his trip down the St. John. It occurs in great abundance along the river as far as Fredericton, preferring the sandy beaches, and springing up as soon as the freshet subsides. This year I noticed it for the first time on the Lower St. John, a few patches of it growing along shore near the foot of Long Reach.

Equally abundant also are the leguminous plants, *Astragalus alpinus* and *Oxytropis campestris*, which I noticed from the mouth of the St. Francis for some distance below Grand Falls. Growing along the shore, and more especially among the disintegrating slate rocks, is *Tofieldia glutinosa*, a plant of the lily family. The last station at which I noticed it was the mouth of the Tobique. On the ledges of calciferous slate which frequently extend into the river on the Upper St. John, the beautiful *Anemone multifida* may be seen growing, and near it the *Anemone Virginiana*. I was unable to find *Anemone parviflora* which is described by Prof. Goodale as being abundant on the slate rocks of the St. John.

In 1879 I reported *Vaccinium caespitosum*, a dwarf species of blue berry, from Lake Temiscouta, province of Quebec, and it was then placed among the N. B. plants for the first time, and as likely to occur on the extreme northern border of the Province, or on high hills further south. This year I found very fine specimens of it both in flower and fruit on the St. Francis, and on the Upper St. John, just above Fort Kent, but it soon disappeared as we descended the river.

Coming out of the St. Francis River we get a magnificent view of the St. John River from the adjacent hills. Looking further up, the valley narrows and the river appears to be shut in by almost perpendicular hills. Looking down river the basin is broader, and the river here and there is dotted with Islands, luxuriant with grass and foliage. Further back from the banks are those magnificent and fertile terraces, formed in the long forgotten past, and further back, crowning the brows and summits of the hills, is a dark back ground of evergreen, the whole forming such a delightful picture of rural loveliness as may seldom be seen, even in this beautiful Province of

ours. The only features in this landscape that give it a dreary sameness are the one storeyed cottages of the habitants, dirty, destitute of paint, and with a poverty-stricken look that strikes one with amazement in this land of plenty; and yet some of these cottages were not altogether lacking in beauty, for Nature, with a generous prodigality, had hidden their defects with a coat of moss! There are many districts further down river where the cottages look neat and pretty; but a little advice to the settlers—English as well as French—upon the Upper St. John, about the utility and beauty of an application of paint to their houses, would not be amiss.

On our upward trip we had a fine opportunity of seeing the country between Edmundston and Fort Kent. Our boat moved along easily, on the top of a Frenchman's wagon, on what thousands of years ago may have been the bed of the river, which now was threading its way—perhaps in some places 100 feet below us. The view from these terraces is beautiful and gave us an idea of this country that could not be obtained in coming along the river by boat, for the frequency of boulders and rapids in our path, warned us not to let our eyes dwell too long on the landscape on either side of us.

Our journey from the mouth of the St. Francis to Andover occupied four days. One day was spent in Camp, at the French village of St. Hilaire, from which place two of our party walked overland to Baker's Lake, a distance of eight miles, but no discoveries rewarded us for this toilsome trip.*

The journey to Andover, a distance of about 100 miles, was sufficiently interesting and exciting to render us forgetful of all fatigue. The water was high enough to render our passage through the rapids comparatively safe. Sometimes we sped along before the wind at the rate of six or eight miles an hour, at others the winds opposed our course when we came to anchor or toiled at the oar. Sometimes the thermometer stood in the nineties, and then again a grateful shower brought relief. During our passage through the gorge below Grand Falls a terrific thunderstorm lent a strange weirdness to the scenery, and gave it a grandeur which pen could

* Along the banks of the St. John, near St. Hilaire, the following plants were noticed in addition to some already named—*Cerastium arvense*, *Silene inflata* (very abundant), *Castilleja pallida*, *Prunus pumila* (very abundant on islands in the river) *Geum album*, *Aster graminifolius*, *Leontodon autumnale*, *Campanula rotundifolia*, *Smilax herbacea*, *Allium Schoenoprasum*.

not adequately describe. The heavy storm cloud seemed almost to rest on the top of the perpendicular cliffs on each side of us, and gave an inky blackness to the rushing waters, through which we were gliding so rapidly; peal after peal of thunder followed in such quick succession that the echoes seemed never to cease; the lightning only relieved the blackness of the gorge to make its blackness more sombre than ever. Suddenly, before the violence of the storm seemed to have abated, the sun shone out behind us and instantly a rainbow formed, extending from the sides of our boat up the cliffs, arching over the space of sky beyond.

From our camping ground at Andover we made visits to Aroostook Falls and the Narrows at the mouth of the Tobique. The Aroostook Falls are about two miles from the junction of that river with the St. John. For nearly a quarter of a mile the river confined within narrow walls of trappean rock rushes among huge boulders and chasms, presenting a scene of wild grandeur and confusion from the tops of the cliffs, nearly 200 feet above. At the lower extremity of the Falls, growing on the rocks, I found *Woodsia glabella* a rare fern in this Province, having been found only at one place by Prof. Fowler—at the Tunnel, Restigouche. That station, I think, is now obliterated by railway excavations. It differs from *Woodsia Ilvensis* which grows in the neighborhood of Greenhead, St. John, and is in great abundance on Long Island, Kennebecasis, being smooth instead of chaffy, and having linear fronds, whereas the *W. Ilvensis* has lanceolate fronds.

Growing on the cliffs, above the Falls was *Polygala Senega*, to which I have already referred as being new to New Brunswick and the North-eastern States. It is a perennial plant with alternate leaves throughout, with white flowers in a solitary spike. The stems, proceeding from thick, knotty rootstocks, have lanceolate leaves. Near the Falls I observed *Aquilegia vulgaris*, which, though a garden plant, had long since ceased to have any fostering care, and was evidently thriving and enjoying its independent existence. *Blitum capitatum*, described in Prof. Fowler's list as being found in gardens, was pointed out to me by Mr. Wetmore, growing in the woods at Andover, and evidently indigenous. This plant, which gets the name of Strawberry Blite from its bright red fruit, is very frequently seen in gardens in the country, but has not hitherto been

considered a native of this Province. It has, I believe, been long known to the Indians about Tobique, who formerly used the juice of the fruit to stain their baskets.

For many miles below the Grand Falls the river is pent up in a narrow channel, through which the current is rapid, carrying the rich material which it constantly wears away, and depositing it on the intervalles farther down the river. A few miles below the Falls the terraces again make their appearance, at first high up above the present bed of the river, and gradually falling so that below the mouth of the Aroostook the more recent terraces are but a few feet above the high water mark. Here some of the richest land in the Province may be found. In the rich thickets along the river-banks, many rare plants were growing in the greatest luxuriance, including *Adiantum pedatum*, our most beautiful fern; *Phryma leptostachya*, *Verbena hastata*, *Amphicarpæa monoica*, *Campanula aparinoides*, *Sanguinaria Canadensis*, *Caulophyllum thalictroides* and many others. Across the river from Upper Andover is the Indian reserve, above the mouth of the Tobique, which contains some of the richest land in the Province, but the Indians make very little use of it for agricultural purposes. At the Narrows, near the mouth of the Tobique, was found *Shepherdia Canadensis* and the somewhat rare *Arnica mollis*, not before reported from the Upper St. John. Here were also *Halenia deflexa* and a new form of *Pyrola*—*P. rotundifolia*, var. *uliginosa*.

At Eel River, York County, the last place where any extended observation was attempted, several rare plants were met with, including *Allium tricoccum*, *Orchis spectabilis*, *Habenaria orbiculata*, *Geum album*, *Verbena urticifolia*, and others

I regret that the great extent of my journey prevented my remaining long enough in one place, thoroughly to examine its flora. There are many rich districts between St. John and Grand Falls which on closer inspection will reward abundantly the zeal and industry of the botanist who shall explore them.

In closing this paper I have to refer to a very remarkable discovery in New Brunswick of a rare fern—*Scolopendrium vulgare* which was found near Woodstock, by James Sutton, Mrs. Charles Connell's gardener. Its discovery may be said to be almost accidental; and we are indebted to Peter Jack, Esq., of Halifax, a gentleman

who devotes his leisure to the study and cultivation of ferns, for bringing this plant from its obscurity, and making it known for the first time in New Brunswick. While Mr. Jack was in Woodstock, in September, he noticed this fern amongst the plants in Mrs. Connell's garden, and on inquiry, he was told that it had been found in the woods, a short distance from town, the previous autumn. He was incredulous, as the fern, though common in England, is rare, or I may say unknown hitherto, in N. E. America. A search for additional specimens proved fruitless, but Mr. Jack writes me that since his return to Halifax, he has received several specimens of the plant which Mr. Sutton was enabled to find after a more diligent search. One of these specimens, dried, Mr. Jack has been kind enough to present to this Society. The only stations in Gray's Botany for this fern are, one or two places in Western New York, and in Ontario, so that its discovery as far east as New Brunswick is a most important one.

Another fern which Mr. Jack sends us is also new to the Maritime Provinces—*Aspidium Goldianum*. He found it near Woodstock in September. The frond of this fern is broadly ovate, the pinnae very long, and the fruit dots very near the mid-vein, quite different in this respect from *Aspidium marginale* which has the fruit dots on the margin of the divisions of the pinnae. Mr. Jack informs me that a Botrychium which he found at Rapide de Femme near Grand Falls, has been pronounced by Prof. Lawson of Halifax *B. ternatum*, var. *rutaefolium*. I have not seen this fern. Mr. Jack's visit to Woodstock was a memorable one, therefore, and the cordial thanks of the Society are due him, not only for the specimens sent us, but for the value of the discoveries made.

NOTE.—In the district which I have explored the past few years—the neighborhood of St. John City, Lower Kennebecasis, and along the course of the St. John River—the following plants, marked as rare or occasional in previous lists, have been detected not infrequently:—*Tussilago farfara* (very abundant weed about the City), *Viola lanceolata*, *Hyoscyamus niger* (ballast), *Nuphar luteum*, var. *pumilum* (very abundant lower course of Salmon River, Queens Co., also at Keswick,—Mr. Brittain reports it from Petitcodiac), *Trifolium procumbens* (noticed it this year as far inland as Prince

William York Co., also at Norton, K. C.,) *Spiraea tomentosa*, *Fragaria vesca*, *Potentilla tridentata* (very abundant and large on Douglas Mountain, common on upper St. John), *Calla palustris*, *Hamamelis Virginica* (also Petitcodiac, Mr. Brittain), *Claytonia Caroliniana*, *Cornus circinata* (also by Mr. Brittain, Petitcodiac), *Aralia racemosa*, *Aster nemoralis*, *A. graminifolius* (abundant clefts of rocks, upper St. John), *Leontodon autumnale*, *Hieracium Canadense* (by Mr. Brittain also, in King's County), *Sagittaria gramineus*, *Goodyera repens*, *Spiranthes Romanzoviana*, *Agrostis canina*, *Ætonia Pennsylvanica*, *Glyceria elongata*, *Aira cæspitosa*, *Avena striata* (the two latter also by Mr. Brittain, Petitcodiac), *Cystopteris bulbifera*, *Woodsia Ilvensis*, *Prunus pumila* (very abundant on islands, upper St. John), *Apocynum cannabinum*, *Tofieldia glutinosa*, *Nabalus racemosus* (Mr. Wetmore, Grand Falls) *Eupatorium ageratoides*, *Habenaria obtusata*, *Aster aestivus*, *Potenilla arguta*.

The following, if not all of them abundant, are at least widely distributed, as they have been reported, with one or two exceptions, from nearly all the districts so far explored in the Province: *Ranunculus recurvatus*, *R. Pennsylvanicus*, *R. Flammula*, var. *reptans*, *Dentaria diphylla*, *Sanicula Marilandica*, *Lonicera cærulea*, *Rudbeckia hirta* (spreading in some southern districts of Province) *Liparis Læsellii*, *Allium Schœnoprasum*, *Viola canina*, var. *sylvestris*, *Smilax herbacea*, *Arethusa bulbosa*, *Pogonia ophioglossoides*, *Monotropa uniflora*, *Moneses uniflora*, *Listera cordata*, *Sedum Rhodiola* (St. George, 5 mls. from Sea Coast, J. Vroom), *Myosotis laxa*, *Campanula aparinoides*, *Veronica officinalis*.

ADDITIONAL LIST OF NEW BRUNSWICK PLANTS.

The following List of Plants, additions to the flora of this Province, together with the occurrence of rare species, attests to the diligence and attentive observation of our botanists during the past year. This diligence has been rewarded by the discovery of nearly FORTY species not hitherto known to exist in the Province. The occurrence of several of these species, such as *Scolopendrium vulgare*, *Echium vulgare*, *Polygala Senega*, *Cardamine pratensis*, is as unexpected as it

is gratifying, as some of these have been found for the first time in North Eastern America.

Mr. Brittain has explored an important field, the eastern portions of St. John and Kings Counties, and parts of Westmoreland County, with marked success. His discoveries have been numerous and important as the subjoined list will show. Mr. Vroom has been successful in finding in Charlotte County many species not before known to exist there. Mr. Wetmore at Andover is in the centre of one of the richest fields for the botanist to be found in the Province, a portion of which he has explored with success the past season.

The Society is indebted to the above named gentlemen, to Mr. Moser, of York County and to Peter Jack, Esq., of Halifax, for the discovery here of new species.

Owing to circumstances the Committee on Botany has not been able to meet this year. Mr. Vroom has, however, communicated to me much valuable information which is embodied in the List appended.

- 14. *Ranunculus sceleratus*, L. St. Stephen, J. Vroom.
- 30. *Sanguinaria Canadensis*, L. Petitcodiac, J. Brittain.
- 37a. *Cardamine pratensis*, L. Cuckoo Flower. St. Patrick, Charlotte County, J. Vroom; rare.
- 55a. *Viola Selkirkii*, Pursh. Near Half-Moon Lake, St. John; St. Francis River, Hay.
- 56a. *Viola Canadensis*, L. Canada Violet. Near Woodstock, R. Chalmers, Peter Jack.
- 81. *Cerasteum arvense*, L. St. Francis, Madawaska County, G. U. Hay.
- 94. *Tilia Americana*, L. Fine specimens of this tree (Bass Wood) found growing along shore of Long Reach, St. John River, and Lower Nerepis, Hay.
- 106. *Rhamnus alnifolius*, L'Her. St. Francis River, Hay; Petitcodiac, J. Brittain.
- 113a. *Polygala Senega*, L. Seneca Snakeroot. Aroostook Falls and Tobique Narrows, Victoria Co., Hay and Wetmore.
- 114. *Trifolium arvense*, L. Lever Settlement, Charlotte County J. Vroom.

130. *Desmodium Canadense*, D. C. Along Hammond River, King's County, Brittain.
- 134a. *Vicia tetrasperma*, L. Petitcodiac, Brittain.
- 137a. *Apios tuberosa*, Moench. Upper St. Croix, Vroom.
139. *Amphicarpæa monoica*, Nutt. Petitcodiac, Brittain; Upper St. Croix, Vroom; Andover, Wetmore.
145. *Geum album*, Gmelin. St. John and Kennebecasis Rivers, Hay. "Common about Hampton," Brittain.
- 145a. *Geum Virginianum*, L. Hampton and Petitcodiac, Brittain.
180. *Parnassia Caroliniana*, Michx. Andover, Victoria County, J. E. Wetmore.
- 187a. *SEDUM ACRE*, L. Mossy Stone Crop. Hampton, Brittain.
(I find a specimen in my collection marked Norton, 1877, apparently overlooked in former lists.)
192. *Hippuris vulgaris*, L. Digdeguash. Charlotte Co., J. Vroom.
194. *Circæa Lutetiana*, L. Lower Norton, Brittain; Eel River, York County, Hay.
199. *Ludwigia palustris*, Ell. Petitcodiac, Nauwigewauk, Taborville, Brittain.
- 201a. *Sanicula Canadensis*, L. Black Snake Root. Lower Norton and Sussex, Brittain.
245. *Nardosmia palmata*, Hook. St. John, Herbert E. Goold; Petitcodiac, Brittain.
260. *Erigeron annuum*, Pers. Daisy Fleabane. Sweet Scabious. "Rather common about Hampton and Petitcodiac," Brittain.
264. *Solidago squarrosa*, Muhl. Andover, Victoria Co., Wetmore.
- 271a. *Solidago neglecta*, Torr. and Gray. St. John County, Hay.
- 272a. *Solidago nemoralis*, Ait. "The most abundant *Solidago* in western part of Charlotte Co.," Vroom.
- 282a. *Bidens connata*, Muhl. Swamp Beggar-ticks. Petitcodiac, Brittain.
- 287a. *CHRYSANTHEMUM SEGETUM*, L. Ballast, St. John, Hay, 1881.
303. *Senecio aureus*, L. var. 2, *Balsamitæ*, Gray, Rocky shores Kennebecasis, Hay. Var. 3, *lanceolatus*, Oakes, Hartland, Carleton Co., Hay. This is one of the most variable plants to be met with along the St. John River. Another form observed at Hartland, Carleton Co., had kidney shaped leaves, the under side of a rich purple color.

304. *Arnica mollis*, Hook. Tobique Narrows, Hay; Andover and Grand Falls, Wetmore.
- 335a. *Vaccinium cæspitosum*, Mx. St. Francis River, and sparingly along shore Upper St. John, Hay.
- 338a. *Arctostaphylos Uva-ursi*, Spreng. Bearberry. Kennebecasis Island, Hay.
- 347a. *Pyrola rotundifolia*, L., var. *uliginosa*, Gray. Andover, Hay.
- 367a. *Utricularia intermedia*, Hayne. St. Patrick, Charlotte Co., Vroom; Otty's Lake, near Hampton, Brittain.
- 373a. *Limosella aquatica*, L., var. *tenuifolia*, Hoffm. Near St. Stephen, Charlotte Co., Vroom; Scarce.
- 382a. *Bartsia Odontites*, Hudson. Abundant on Island, Falls, Mouth St. John, Hay.
- 384a. *Pedicularis Furbishiae*, Watson. "Growing on wet banks St. John River from Van Buren, Me., south about sixty miles. Allied to *P. Canadensis* and dedicated to Miss Kate Furbish,"—Prof. Sereno Watson. Upper St. John, Hay; Andover, Wetmore.
- 386b. *Phryma Leptostachya*, L. Andover, Wetmore; Lower Norton, Brittain.
- 400a. *GALEOPSIS LADANUM*, L. Hemp Nettle. Ballast, St. John, 1881, Hay.
401. *Stachys palustris*, Mx., var. *aspera*, Gray. Quaco, Brittain; Partridge Island, Hay; St. Andrews, Vroom, 1880.
- 403a. *ECHIUUM VULGARE*, L. Blue Weed. Viper's Bugloss. Quaco and Petitcodiac, Brittain. This last addition to our troublesome weeds is rare in N. E. America, although widely distributed in Europe and Northern Asia. It is a rough, bristly biennial, has a red-purple corolla in bud, afterwards changing to a brilliant blue.
- 409a. *Cynoglossum Virginicum*, L. Wild Comfrey. Petitcodiac, Brittain.
418. *GENTIANA AMARELLA*, L., var. *acuta*, Hook. f. Island, Falls, Mouth of St. John, Hay.
- 420a. *Limnanthemum lacunosum*, Grisebach. Several stations in Kings County, Brittain.
424. *Asclepias incarnata*, L. Keswick, Hay; Lower Norton and Hammond River, Brittain; Charlotte County, Vroom.

431. *Blitum capitatum*, L. Andover, Wetmore. Doubtless indigenous.
- 431a. *Polygonum hydropiperoides*, Mx. Mild Water-pepper. Bloomfield, K. C., Brittain.
469. *Pilea pumila*, Gray. Petitcodiac and Havelock, Brittain.
- 469*. *CANNABIS SATIVA*, L. Hemp. "Spontaneous for years, near Taborville Bridge, K. C.," Brittain.
503. *Pinus Banksiana*, Lambert. "Forms thick groves, extending for miles about Petitcodiac and Anagance, where it is a handsome tree from 30 to 50 feet high, valuable for timber," Vroom.
- 517a. *Symplocarpus fœtidus*, Salisb. Near Episcopal Church, Lower Hammond River, Brittain. Said to be a troublesome weed on the Stock Farm.
- 532a. *Potamogeton Robbinsii*, Oakes. Hampton and Petitcodiac, Brittain.
535. *Scheuchzeria palustris*, L. Tay's Mills, York County, Moser; St. Stephen, Vroom.
- 539a. *Orchis spectabilis*, L. Eel River, York County, Hay.
- 541a. *Habenaria viridis*, R. Br., var. *bracteata*, Reichenbach. Taborville, Brittain.
546. *Habenaria blephariglottis*, Hook. Tay's Mills, York Co., J. Moser.
- 547a. *Habenaria lacera*, R. Br. Hampton, Brittain.
- 549a. *Goodyera pubescens*, R. Br. Petitcodiac, Brittain.
556. *Calypso borealis*, Salisbury. The great beauty of this rare plant is an excuse for another reference to its whereabouts. Many specimens of it were found near the Half-moon Lake, near St. John, this year, and Mr. Brittain sends a handsome specimen from Petitcodiac, found by Mr. Vroom.
- 581a. *Polygonatum biflorum*, Ell. St. Francis and Upper St. John, Hay, Wetmore; Petitcodiac, Brittain.
- 583a. *Allium tricoccum*, Ait. Eel River, York Co., Hay; near Hampton, Brittain.
598. *Pontederia cordata*, L. Grand Lake, and at several points on St. John River, Hay; quite common in western parts of Charlotte County, Vroom.
- 607a. *Scirpus Clintonii*, Gray. Digdeguash, Vroom.

- 607b. *Scirpus subterminalis*, Torr. Petitcodiac, Brittain.
- 619a. *Rhynchospora fusca*, Roem. and Schultes. Beak Rush. Near Hampton, Brittain.
645. *Carex lanuginosa*, Mx. Petitcodiac and Moneton, Brittain; Upper St. John, Hay.
- 683a. *Zizania aquatica*, L. Indian Rice. Water Oats. Abundant in water at Hampton and other places in King's County, Brittain.
- 692a. *Muhlenbergia Mexicana*, Trin. Petitcodiac, Brittain.
696. *Oryzopsis asperifolia*, Mx. Common about Petitcodiac, Brittain.
- 699a. *Graphephorum melicoides*, Beauv. Titusville, K. C., Brittain.
- 710a. *Poa caesia*, Smith. Taborville, K. C., Brittain.
- 714b. *Festuca nutans*, Willd. Lower Norton, Brittain.
718. *Phragmites communis*, Trin. St. Stephen, Vroom.
723. *Elymus Canadensis* L. Sussex and Petitcodiac, Brittain.
- 734a. *PANICUM GLABRUM*, Gaudin. Hampton, Brittain.
748. *Asplenium viride*, Huds. Becoming more common about St. John in the moist, shady clefts of limestone rocks. Have found it at no less than seven stations near St. John the past year, Hay.
- 750a. *Scolopendrium vulgare*, Smith. Near Woodstock, Jas. Sutton, 1881; identified by Peter Jack, Esq., Halifax; rare.
- 757a. *Aspidium Goldianum*, Hook. Near Woodstock, Peter Jack. Probably rare in New Brunswick.
760. *Aspidium aculeatum*, Swartz, var. *Braunii*, Koch. St. Francis River, Andover, Hay.
766. *Woodsia glabella*, R. Br. Aroostook Falls, Hay and Wetmore; Grand Falls, Peter Jack.
- 771a. *Botrychium matricariaefolium*, Eaton. Petitcodiac and Titusville, K. C., Brittain, 1881. A slender and beautiful species, from 3 to 9 in. high; a smaller form growing in moss.



NOTE ON LINARIA CYMBALARIA.

BY JAMES VROOM.

It may not be generally known that the rare phenomenon of apheliotropism, or turning from the light, is observable in the peduncles of the common Kenilworth or Coliseum Ivy (*Linaria Cymbalaria*.) This little plant raises its flower buds an inch or more above the trailing stem ; but, as soon as the flower opens, the base of the flower stalk begins to bend downward, the middle of the stalk at the same time bending in the opposite direction, so that the lower part of the peduncle takes the form of the letter S laid on its side (∞)—the portion immediately below the flower still being erect. The second curvature, however, does not remain, but passes slowly along the flower stalk, drawing the flower downward, so that soon after the corolla falls the growing seed pod lies upon the ground, or, where the stem is raised high enough to admit of it, points directly downward. This might seem to be due to the influence of gravitation, but when the plant is grown before a window (as we frequently see it here) the fruit stalks, instead of reaching downward, are found extending towards the darkest part of the room.

In a room with one window, a pot of *Linaria* was hanging near the blind, so that the light could not reach it from above. The peduncles, which lengthen considerably after flowering, stretched out two or three inches horizontally, and where they received the strongest light from below even took an upward direction. The pot was turned around so that the stalks were parallel with the glass. In three hours the growing peduncles could be seen turning away from the light, and in a day or two most of them were found bent at right angles, the curvature in this case seeming to begin immediately below the seedpod. Yet a certain amount of light is necessary for perfecting the seed ; for when moved to a darker place the peduncles, though still pointing towards the darkest part of the room, were “drawn” to twice their usual length and presented the general appearance of a plant suffering from want of sufficient light.

ORNITHOLOGICAL NOTES.

BY MONTAGUE CHAMBERLAIN.

The members of this society who are interested in Ornithology have, during the year that has just closed, made considerable progress in the study of the distribution of the species occurring within the Province and have acquired other information which will be utilized when a revision of the catalogue of birds, published in the last number of this Bulletin, shall be undertaken. This revision must however be deferred for a number of years unless more workers can be induced to enter the field, as the present number of observers is very limited and these have but little opportunity to prosecute the study and there yet remains an immense extent of country of which no systematic exploration has been made.

In this connection it might be stated that the Committee would gladly avail themselves of the co-operation of persons who are not members; and if assistance was rendered them by residents in the various districts of the Province the value of the annotations to the catalogue would be very largely increased and the time hastened when its revision could be satisfactorily completed.

The County of St. John has as usual received most attention from the ornithologists of the society during the year, and the previous determinations regarding the birds found there have been confirmed and an addition made to the list of several species not previously observed.

The species new to the locality are as follows :—*

AMERICAN TITLARK (*Anthus ludovicianus*).—During October last several large flocks were observed on the Courtenay Bay Flats, at Little River, and in the vicinity of the Manawagonish marshes.

LAPLAND LONGSPUR (*Ceotrophanes lapponicus*).—Mr. Pinkerton took three specimens near the Ballast Wharf and a few others were observed by Messrs. Daniel and Morrissey, all in the last week of December, and in every instance they were in the company of Snow Buntings.

*Several of these "notes" have been recorded by the writer in the January number of the Bulletin of the Nuttall Club.

PIPING PLOVER (*Ægialites melodus*).—On May 6th Mr. Ellis shot two of this species at St. Martins and on May 9th Baron de Tuyl secured two at Maces' Bay.

WHISTLING SWAN (*Cygnus americanus*).—The only example of this species known to have been observed in this Province was shot by George Barnhill, Esq., at Belvidere Lake on April 8th.

REDHEAD DUCK (*Aethya americana*).—On October 16th three were offered for sale in the St. John market and on the 27th of the same month two more were to be seen there; all were said to have been taken within 20 miles of St. John.

Two of the "shore birds," RING-NECKED PLOVER (*Ægialites semipalmatus* and LEAST SANDPIPER (*Actodromas minutilla*) were observed during the last of May, an unusual occurrence, for though both species are exceedingly abundant in the autumn neither had been seen previously in the spring.

Among other interesting occurrences of the year was that of a flock of the IPSWICH SPARROW (*Passerculus princeps*), discovered by Mr. Alfred Morrissey on Courtenay Bay Flats on April 11th; also several PINE GROSBEEK (*Pinicola enuncleator*) that spent the summer in the vicinity of Sandy Point and were made the subject of special study by Mr. James W. Banks. One pair was discovered at work at the foundation of a nest and the female accidentally killed.

Several explorations were made into the adjacent counties of Kings and Queens, notably one under the leadership of Mr. Harold Gilbert. Among other questions of interest which the observations then made have determined is the confirmation of the statement made by the writer in the Catalogue of New Brunswick Birds, (p. 37,) that many of the species of birds rarely met with in the vicinity of the coast of the Bay of Fundy during the breeding season are much more abundant at that time beyond the line across which the humidity and low temperature so characteristic of this coast at that season do not penetrate, said line being drawn some 15 to 20 miles from the shore of the Bay.

In an article on the Birds of the Catskill Mountains by Mr. Eugene P. Bicknell, published in the Transactions of the Linnæan Society of New York, lately issued the author advances

the theory that the representatives of the Canadian Fauna which were observed at the higher altitudes of the mountains were attracted thither, in their choice of a breeding resort by the humidity of the atmosphere and the consequent character of the vegetation. But here in New Brunswick the same species of birds mentioned by Mr. Bicknell act exactly the reverse to what they do in the Catskills. We have much the same differing atmospheric conditions and in similar relation, to state it broadly, as that of the higher and lower altitudes of the mountains, but while the birds of the Catskills appear to seek the cooler and more moist regions to breed in, the mass of our Provincial birds (not only the *sylicolida* as previously noted) retire from the humid zone and build in the warmer, drier atmosphere of the interior. Even the few species that are common near the coast at this season are equally as abundant beyond.

With these facts before us and the emphatic contradiction they appear to yield to Mr. Bicknell's theory, must not some other cause for the migration of these species be sought for?

In June last Mr. Fred Daniel and the writer accompanied Mr. H. A. Purdie of the Nuttall Club, Cambridge, on a collecting trip through Madawaska County making *en route*, a hurried visit to Washademoak Lake.

During our stay in the vicinity of Edmundston we were enabled to identify 74 species of birds, and the list of their names exhibits but slight variation from that obtainable at almost any point on the St. John river south of that locality.

Among the conspicuous absentees noted were Bluebird, Mourning Warbler, Rose-breasted Grosbeak, Crow Blackbird, Least Fly catcher (only one was heard at Edmundston and another was heard at Fredericton) and Blue Jay, all reported by Mr. Batchelder as more or less common at Grand Falls, but a few miles south, and we missed the Bobolink and the Red-winged Blackbird which are such obtrusive residents of the river banks from Woodstock to Westfield.

One Grass Finch was heard singing at Saint Hilaire and another at Cole's Island, at which station it divided with a Whip-poor-will the chief interest of the party; but the swift proved a perfect will-o-the-wisp to the individual who attempted its capture, the ventriloquist character of its voice being very marked.

At Edmundston some six examples of the Cape May Warbler were secured and as many of the Philadelphia Vireo. Neither of these species have been observed near St. John though Mr. Boardman reports the Cap May as a regular visitor to the neighborhood of St. Stephen and breeding there. The Philadelphia is recorded in New England-Bird life as the rarest of the Greenlets in those states; and Mr. Everett Smith reports it "uncommon" in Maine. It is not given by Mr. Nathan C. Brown in his Catalogue of birds of the vicinity of Portland, and I can find a record of but two examples for Eastern Maine, one taken by Professor Verrill at Waterville in 1863 and the other by Mr. George A. Boardman at Calais in 1872. It not occurring regularly in Eastern Maine, and Mr. Batchelder finding it at Grand Falls in 1881, and our meeting it again in 1882 at Edmundston suggests the idea that the species must pass north by a western route, and journey more directly east after reaching the higher latitude. The specimens we secured were evidently mated.



SUMMARY OF MEETINGS.

FEBRUARY 7TH.

Dr. LeBaron Botsford, President, delivered his annual address, answering the questions—What is a Natural History Society?—What its objects and why is it necessary?—in a clear, pointed and interesting manner.

MARCH 7TH.

Mr. Robt. Chalmers read the paper of the evening on the Surface Geology of the Bay of Chaleur Region, with particular reference to the stratified marine clay and sands which form its shores and estuary deposits; its more recent formations, and the evidence of a subsidence of land which has taken place in the northern part of the Province; together with observations on drift phenomena, and other interesting facts on the geological structure and history of the region mentioned.

APRIL 4TH.

Mr. Matthew's lecture this evening on the *Paradoxides* of the St. John group was descriptive of the general relations of *Paradoxides* to other forms of the animal kingdom; the conditions under which the fossils of this genus and other Cambrian organisms are found near St. John; and descriptions of two new species and several varieties found in the rocks at St. John. Specimens of the St. John fossils and of species of *Paradoxides* from Bohemia were exhibited. The Saint John fossils have been described in a paper communicated by Mr. Matthew to the Royal Society of Canada at its inaugural meeting in May last.

MAY 2ND.

Dr. Walker delivered an address on the formation and growth of Coral. After describing the animal, which is of the radiate type, he shewed what the coral formation really is, and explained its composition. He punctured several of the old theories about the insect (?) and the results of its labors, and compared these with the later revelations of coral formation as described by Darwin.

JUNE 6TH.

Jas. A. Estey, Esq., read the paper of the evening, an interesting account of the Life and Writings of the Dead Naturalist,—Charles Darwin.

JULY 4TH.

The leaders of the several sections of the Field Meeting, held at Duck Cove on the 24th ult., presented reports shewing their observation of the Natural History of that region.

A contribution from Mr. Jas. Vroom, St. Stephen, on some peculiarities he had noticed in the *Linaria Cymbalaria* was read. The paper is re-produced in another part of this bulletin.

AUGUST 1ST.

The paper of the evening was read by Mr. G. F. Matthew, on the Lacustrine Formation of the Torryburn Valley. It is published in another part of the Bulletin.

SEPTEMBER 5TH.

Prof. Bailey read the paper of the evening on the St. John River Valley. He referred to the great importance which attaches to rivers from a geological stand-point. The St. John River basin comprises no less than eight geological formations. The character of this basin is greatly influenced by the falls at the mouth and the "narrows" through which the water is driven so impetuously by the flowing and ebbing of the tide. The mouth of the St. John at one period was probably about a mile west of the present mouth.

OCTOBER 3RD.

The paper of the evening on our Native Wading Birds was read by Mr. M. Chamberlain. He gave a very interesting description of their habits and principal characteristics, explaining and illustrating his remarks by means of the very complete collection in the Society's rooms.

NOVEMBER 7TH.

The paper of the evening—The Botany of the Upper St. John—read by Mr. G. U. Hay, is published in the Botanical section of this Bulletin.

An extra meeting was held in the Society's rooms on the evening of November 10, when Dr. Geo. Patterson, of Pictou, gave a very

interesting oral address on the Stone Age of the Micmacs, illustrating his remarks by numerous relics.

DECEMBER 5TH.

A resolution to accept the invitation of the Royal Society and become incorporated with it was adopted.

Mr. Harold Gilbert read a paper on the "Singing Birds of New Brunswick," giving a short history of the numerous families that comprise this interesting order of birds that visit our Province during the summer and winter, pointing out many peculiarities in their migration, and shewing from specimens taken from the Museum of the Society, the distinguishing characteristics of each family.

Reasons were given for many of their peculiarities in migrating, shewing that birds which are now uncommon in this Province may yet become quite common, as orchard, field and garden take the place of our forests which now cover the greater portion of our Province. From carefully prepared notes shewing the vast amount of insect food required by many of these birds, they were shewn to be the most useful and most deserving of protection of any of the orders of our birds.

JANUARY 10TH, 1883.

The paper of the evening, adjourned from January 2nd, was read by Mr. W. F. Best, on the Spectroscope and its Uses. It was an intelligent and interesting description of an instrument that has caused wonderful progress in the sciences, chiefly of astronomy and chemistry. Many interesting-experiments were shewn, illustrating the uses of the instrument.

REPORT OF COUNCIL.

The Council of the Natural History Society of New Brunswick beg leave to submit the following summary of the operations of the Society for the past year.

MEMBERS.

There are at present 1 Honorary Member ; 6 Life Members ; 70 Ordinary Members ; 30 Associate Members, and 32 Corresponding Members ; being an increase for the year of 30 Ordinary Members ; 15 Associate Members, and 8 Corresponding Members.

The Recording Secretary reports as follows :—

During the year just closed twelve regular meetings of the Society have been held at which the papers mentioned in the preceding summary of meetings were read.

The following free elementary lectures on scientific subjects were delivered in the rooms of the Society :—

Jan'y 10.—Industrial Drawing, by Mr. G. Ernest Fairweather.

Feb'y 27.—Chemistry, Air and Water, Dr. Coleman.

March 21.—The Microscope, Dr. Allison.

April 18.—Birds and Nests, Mr. M. Chamberlain.

May 16.—Spring Plants, Mr. G. U. Hay.

Mr. Chamberlain has also, upon several occasions, addressed the children from some of the Public Schools in the Society's rooms, illustrating his remarks by specimens from the Ornithological collection.

A most successful Field Meeting was held by the Society, in connection with the Eclectic Reading Club, at Duck Cove, Lancaster, on June 24th, and a well-attended *Conversazione* was held in the Society's rooms on Thursday, 27th April.

LIBRARY.

The Librarian reports that there have been added to the Library thirty-one books and pamphlets during the past year ; and that the books have been catalogued and numbered.

FINANCE.

The Treasurer reports that the cash expenditure for the past year amounts to the sum of \$275.57. The income during the same time, from all sources, amounts to \$276.58 ; leaving a balance on hand of \$1.01.

The Council have much pleasure in stating that, since the last annual meeting, the cases for the collections of native birds, referred to in the last Annual Report, have been procured at a cost of \$400, and are now placed in the rooms of the Society. Part of the cost of these cases has been paid by subscriptions received from friends of the Society, whose names appear in the list of benefactors appended to this Report, and part has been paid out of the general fund of the Society ; but there is a balance remaining unpaid amounting to about \$120.00 In the early part of the year the lecture room,

being found insufficient in size, was extended by cutting an archway into the adjoining room, and the capacity of the rooms for meetings and lectures has been greatly increased.

W. J. WILSON,
Sec. to Council.

DONATIONS TO THE MUSEUM,
FOR THE YEAR ENDED 17TH JANUARY, 1883.

DONORS' NAMES.	DONATIONS.
"A friend," through L. C. AL- LISON, M. D.,	A number of specimens of Minerals and two Barnacles of extraordi- nary size.
W. E. COLLIER, Esq.,	Apatite Crystals from Ottawa.
THOS. E. DYER, Esq.,	Amethystine Quartz and Sea Fan, (Gorgonia.)
J. W. BANKS, Esq.,	Specular Iron Ore.
G. M. DUNCAN, Esq., M. D., of Bathurst,	Quartz Arrow-heads, Fossil Shell, Spirifer, Claw of a Raptorial Bird entangled in the burrows of Pholas.
R. PENNISTON STARR, Esq.,	Fossil Root (<i>Stigmaria ficoides</i>).
W. I. LOGAN, Esq.,	Case of Fossil Shells, Minerals, &c., from Palestine and United States.
G. E. SNIDER, Esq.,	Fossil Shell from Chincha Islands.
ALEXANDER ROSS, Esq.,	Two Fossil Fish from Devonian For- mation at Dalhousie.
J. H. THORNTON, Esq.,	Fossil Wood (<i>Dadoxylon</i>) from Point Wolfe Quarries.
MISS E. MURRAY,	Shark Teeth from phosphate beds of South Carolina.
LT. COL. TAYLOR,	Fossil Fern, (<i>Pecopteris</i>).

DONATIONS TO THE MUSEUM.—(*Continued.*)

DONORS' NAMES.	DONATIONS.
C. U. HANFORD, Esq.,	Sand-dollar, (Clypeaster) taken from the stomach of a codfish. Mutilated Claw of a Lobster repaired by the animal.
J. H. WRIGHT, Esq.,	Hymenopterous Insect and Cocoon of a Wasp.
R. P. CROOKSHANK, Esq., M. D.,	One Small Brown Snake.
GEO. H. PURDY,	Four Embryo Snakes; 3 Albatrosses.
R. BRITAIN, Esq.,	Five Sponges from Basin of Minas.
PETER JACK, Esq., Halifax,	Two dried specimens of Ferns.
GEO. U. HAY, Esq.,	Twenty Native Plants.
MASTER FRED. CAMPBELL,	One Dragon Fly. Irised Coal.
GIBSON WILLIAMSON, Esq., Oak Point,	Two Cases Insects. One Cat Bird.
ROBT. HAZEN, Esq.,	One Blue Heron. One Turnstone. 1 Least Sandpiper. 1 Canada Jay.
W. F. BEST, Esq.,	Four Ptarmigan, (2 in Winter and 2 in Summer plumage), from Newfoundland.
W. GILPIN, Esq.,	One Eider Duck. 1 White Winged Coot. 1 Herring Gull.
GEO. HARE, Esq.,	One Shell Drake.
JAMES DANIEL, Esq., M. D.,	One Loon.
H. A. PURDIE, Esq., Boston,	Nest and Eggs of Chipping Sparrow. " " " Marsh Hawk.
JAS. W. BANKS, Esq.,	Four Nests and Eggs of Native Birds.

DONATIONS TO THE MUSEUM.—(*Continued.*)

DONORS' NAMES.	DONATIONS.
FRED. W. DANIEL, Esq.,	Seven Native Birds, and three Nests and Eggs of Native Birds.
HAROLD GILBERT, Esq.,	Four Native Birds.
ALFRED MORRISEY, Esq.,	Eight Native Birds.
M. CHAMBERLAIN, Esq.,	Forty-six Native Birds. Twenty-seven sets of Eggs, and eleven Nests of Native Birds. Two Squirrels. One Chipmunk.
J. W. WILLIAMS, Esq.,	Solitary Sandpiper. Skeletons of heads of Robins. Least Sandpiper and Ruby-throated Humming Bird.
JAMES ANDERSON, Esq.,	Pileated Woodpecker.

DONATIONS TO THE MUSEUM FUND.

HON. ISAAC BURPEE, . . . \$25.00	GEN. D. B. WARNER, . . . \$ 5.00
WM. ELDER, Esq., 5.00	D. C. DAWSON, Esq., 2.00
T. W. DANIEL, Esq., 10.00	GEO. F. SMITH, Esq., 5.00
L. B. BOTSFORD, M. D., . . . 25.00	W. F. HATHEWAY, Esq., . . . 5.00
G. F. MATTHEW, Esq., 10.00	J. C. ALLISON, Esq., 2.00
W. F. COLEMAN, M. D., . . . 5.00	R. PENNISTON STARR, Esq., . . . 5.00
G. E. FAIRWEATHER, Esq., . . . 6.00	HON. JOHN BOYD, 5.00
L. C. ALLISON, M. D., . . . 2.00	SAMUEL SCHOFIELD, 2.00
JAMES A. ESTEY, Esq., . . . 10.00	A FRIEND, 1.25
GILBERT MURDOCH, Esq., . . . 5.00	R. D. WILMOT, Lt. Gov., . . . 10.00
G. W. WHITNEY, Esq., 5.00	G. U. HAY, Esq., 5.50
W. F. BEST, \$2.00.	

STANDING COMMITTEES FOR 1883.

Physics and Chemistry :

W. F. Coleman, M. D. W. F. Best. George U. Hay.

Meteorology :

Gilbert Murdoch. William Murdoch.

Mineralogy :

G. F. Matthew, M. A. W. F. Best. R. Penniston Starr.

Geology :

G. F. Matthew, M. A. W. N. Gould. W. J. Wilson.

Botany :

George U. Hay. Robert Chalmers. James Vroom, (St. Stephen).

Entomology :

M. Chamberlain. Gibson Williamson. Herbert E. Goold.

Invertebrate Zoology :

L. C. Allison, M. D. Mrs. C. E. Heustis. P. R. Inches.

Vertebrate Zoology :

LeB. Botsford, M. D. L. C. Allison, M. D. W. F. Coleman, M. D.

Ornithology :

M. Chamberlain. Harold Gilbert. Jas. W. Banks. F. W. Daniel.
A. Morrisey.

Library :

W. J. Wilson. Robert Chalmers. G. Ernest Fairweather.

Essays :

G. F. Matthew, M. A. W. F. Best. W. F. Coleman, M. D.

Lectures :

Geo. U. Hay. G. Ernest Fairweather. L. C. Allison, M. D.

Publishing :

M. Chamberlain. G. F. Matthew. Geo. U. Hay.

Hall:

M. Chamberlain. Geo. U. Hay. John Hammond. W. J. Wilson.

Finance:

Jas. A. Estey. G. Ernest Fairweather. G. F. Matthew.

Delegate to Royal Society:

G. U. Hay.

Alternative:

M. Chamberlain.

During the year the following names have been added to the roll of

ORDINARY MEMBERS.

February 7.

Simeon Jones,.....Merchant.
W. L. Busby,..... do.
C. E. Burpee,..... do.
W. F. Bunting,.....Assessor.
Jas. H. Pullen,.....Painter.
H. G. Betts,..... Barrister.
R. P. McGivern,..... do.

March 7.

J.W. Williams,....Draughtsman.

April 4.

A. I. Trueman,.....Barrister.

May 2.

Master F. B. Ellis.....Student.
Rev. O. S. Newnham, Clergyman.
H. J. Thorne,..... Merchant.
H. C. Preston,.....Physician.
S. J. King,.....Postmaster.
W. J. Sutherland,.....Clerk.

June 6.

E. J. Simonds,.....Gentleman.

J. Gillis Jones,.....Clerk.
Rev. Irvin L. Beman, Clergyman.

July 4.

R. Keltie Jones,.....Clerk.
D. C. Robertson,..... do.
W. S. Willis,..... Ironworker.

August 1.

W. E. Broad,.....Clerk.

September 5.

W. S. Carter,.....Teacher.
Thos. Stothart,..... do.

November 7.

Malcolm McKay,..... Merchant.
Jas. Stratton,.....Barrister.

December 4.

Edwin Fisher,.... Merchant.
W. E. Collier,.....Banker.
R. C. Skinner,.....Barrister.

January 9.

E. H. S. Flood,.....Clerk.

CORRESPONDING MEMBERS.

January 6.	September 5.
G. H. Burnett,..... <i>Richibucto.</i>	J. E. Whelpley,..... <i>Hampton.</i>
July 4.	October 3.
R. C. Weldon,..... <i>Sackville.</i>	Gabriel DeVeber,..... <i>Gagetown.</i>
Gibson Williamson,... <i>Oak Point.</i>	L. J. Fowler,..... <i>Washademoak.</i>
August 1.	December 4.
J. E. Wetmore,..... <i>Andover.</i>	R. C. Boxall, C. E.,..... <i>Sackville.</i>

Making an addition to the roll of 30 Ordinary and 8 Corresponding Members.

ASSOCIATE MEMBERS.

Miss Bessie Whitney,	Miss Manning Skinner.
Mrs. G. Ernest Fairweather,	Miss Ella Marven,
Miss M. W. Hartt,	Miss Emma Christie,
Miss M. A. Peters,	Miss Emily Hartt,
Miss Janet P. Robertson,	Miss Underhill,
Mrs. Ferdinand Pryor,	Miss Maud Underhill,
Miss Sarah Bernard,	Mrs. Catharine Goddard.
Miss Flora McDonald,	

ERRATA.

Page 9, line 36,—for *nucleus* read *nucules*.

“ 13, lines 30, 31 and 32,—for *Nos.* and *No.* read *Figs.* and *Fig*

“ 17, line 21,—for *ametiferous* read *amentiferous*.

“ 32, “ 25,— “ *smilax* read *Smilax*.

“ 33, “ 14,— “ *new species* read *species new to the Province*.

“ 39, “ 30,— “ *Ceotrophanes* read *Centrophanes*.

“ 40, “ 8,— “ *Aethyia* read *Æthyia*.

“ 41, “ 38,— “ *swift* read *latter*.

“ 42, “ 7,— “ *New England-Bird life* read *New England
Bird-life*.

“ 47, “ 26,— “ *J. H. Thornton* read *J. N. Thornton*.

“ 48, “ 11,— “ *snakes* read *sharks*.

“ 48, “ 24,— “ *Shell Drake* read *Sheldrakes*.



